

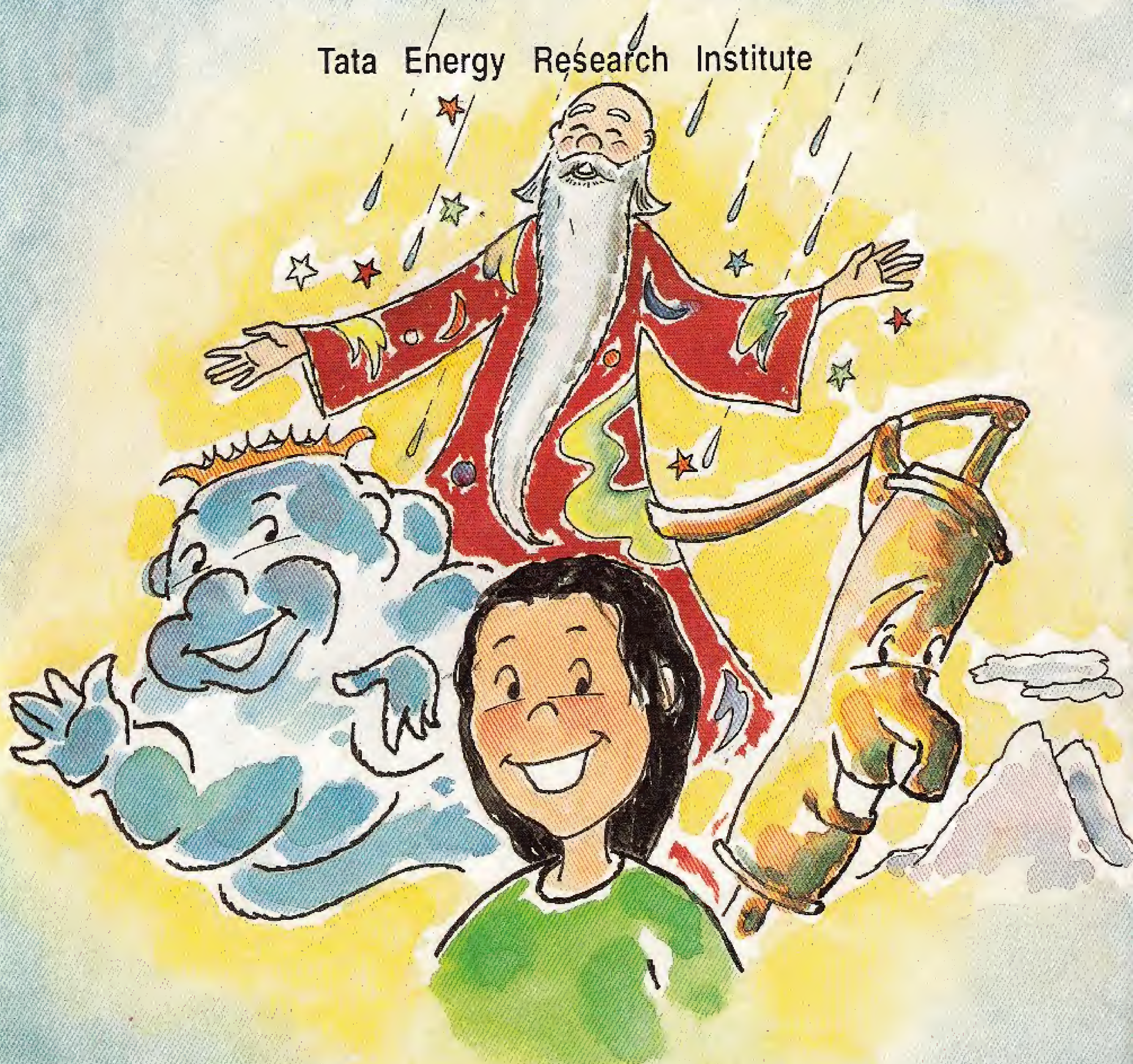
TERI

ENVIRONMENT PLAY SERIES

Chhutki's Wonderful Adventures ...

THE WATER STORY

Tata Energy Research Institute



TERI ENVIRONMENT PLAY SERIES

Chhutki's Wonderful Adventures ...

THE WATER STORY

Water Cycle and Water Sources

Tata Energy Research Institute



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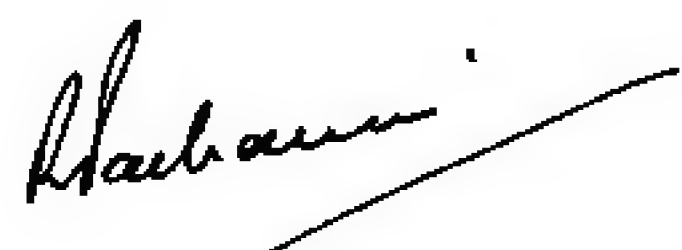
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Foreword

This set of stories and the series dealing with the environment specially designed for children mark an innovation in TERI's activities. TERI as an institute is dedicated not only to analysing problems related to energy, environment, and natural resources in general, but also to finding solutions in these areas and disseminating information about them. There could be nothing more effective in laying the foundation for solutions to tomorrow's problems than creating an awareness and understanding on these among our children. Yet, this is a task perhaps far more daunting and difficult than that of explaining these issues to adults. To translate scientific and economic logic to a level of simplicity that does not presuppose an adequate level of knowledge is difficult. The presentation has to be absorbing, interesting, and even entertaining. Yet it must have a sound intellectual and logical basis. At the very heart of solutions for the future lies the whole question of life styles and patterns of development. Yet, children are sensitive and generally unburdened by the baggage of the past. If the presentation of scientific or economic facts put before them is well thought out and appealing, their attitudes and actions would respond fully. It is for this reason that the message arising out of growing water scarcity, increasing pollution and the need for a conservation ethic has been built around a story that would appeal to the enquiring mind of a small child, who is not relying on rote memory, but who would like to absorb lessons that appeal to his or her imagination and which appear to be

an intimate part of the day to day lives of children. The issues covered in this publication attempt to put across scientific and social facts in story form to stimulate the minds of young readers.

This publication would not have been possible without the partnership that has been developed between Frank Brothers & Co., an established and reputed producer of schoolbooks, and TERI, an independent non-profit research institution. The credit for this initiation and partnership goes to Mr R C Govil, Chairman, Frank Brothers & Co. (Publishers) Ltd., for having approached TERI in the first place. As it happens, within TERI itself, considerable debate and discussion had already taken place on the need for the Institute to get into the field of environmental education for children. This partnership is, therefore, timely and relevant. In any such initiative, while every effort is made to attain standards that would make the enterprise effective and worthwhile, in the ultimate analysis, it is only the user of the material produced who can testify to its value. We, at TERI, therefore, are approaching this task in a spirit of humility and would request the youngest of our young readers to give us very critical comments on this series of publications. It is only on the basis of your feedback and views that we can improve subsequent publications to reach up to your expectations. I hope you enjoy reading about Chhutki and her adventures.



R K Pachauri
Director
TERI

For the reader

This is the first of the TERI Environment play series for children between the ages of 6 and 9 years, who have basic understanding and communicating skills in English.

Intended to supplement environmental studies, this book is designed as an innovative package of fun and learning through drama, simple activity, and information. The script may be used by teachers and students in the classrooms or community centres to present information and create awareness in a new and effective form.

Simple word meanings are included alongside the text to help children clearly understand words and terms being used.

Activities suggested are simple, safe and workable and are intended to help the student understand scientific laws and processes easily, and their practical application in daily life.

The scripted story deals with characters and situations that are both true-to-life and fantastic, provides the players with the challenge of presenting an effective dramatization which is safe, economical, and interesting.

Simple sets may be used like the teacher's table and chair placed near the classroom door, for the home in scene 1 and a mattress or a small platform for clouds in scene 2.

Props can be found in everyday items at school or home. An umbrella and shopping bag for the mother, and cardboard and gold paper for making a crown for King Cloudy.

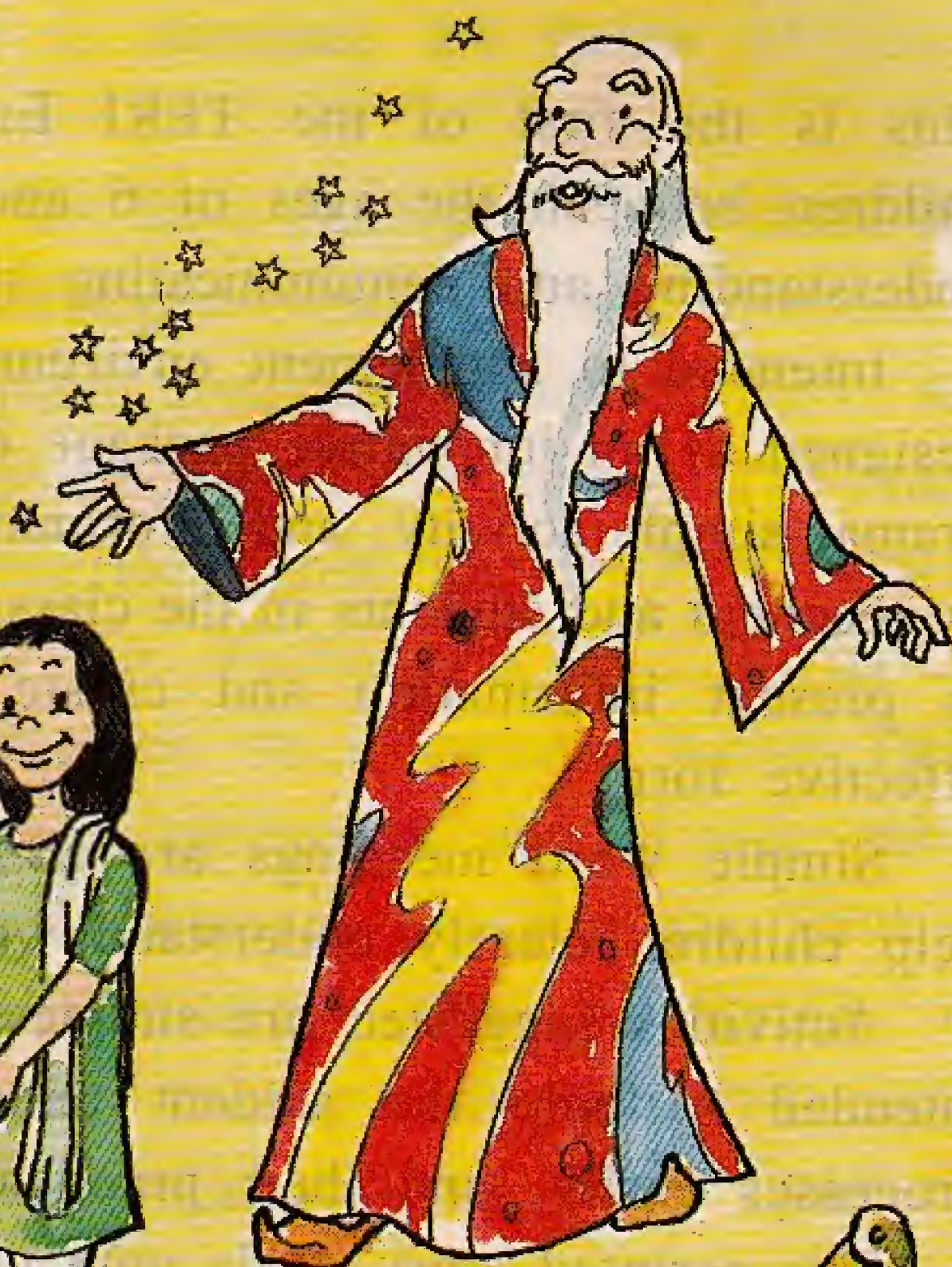
Costumes can be organized from an assortment of spare, brightly coloured pieces of cloth and coloured paper.

We welcome your comments and suggestions to help us improve our future publications and make them better-suited to your needs.

MOTHER



BAADSHAH



CHHUTKI



CLOUDY



HAPPY

Characters in the play

THE WATER STORY

Water cycle and water sources

Characters

- Chhutki** : An eight-year-old girl, who wants to know everything about the world we live in.
- Mother** : Chhutki's mother.
- Baadshah** : A doll. In Chhutki's dream it turns into a magical old man, cheerful, full of energy and very wise. A good friend of Chhutki.
- Cloudy** : The king of clouds. He has a cheerful, chubby, snowy white face.
- Happy** : The talking handpump. A cheerful friend of Baadshah.

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Chhutki dear, will you please help me find my umbrella?

Chhutki's home

It is a rainy afternoon. Chhutki is busy completing her homework. Her mother enters the room carrying a shopping bag. She is looking for the umbrella.

Mother : Chhutki dear, will you please help me find my umbrella? It is raining and I have to go to the market to buy some vegetables.

Chhutki : *(Goes out of the room and returns with the umbrella.)* Here, mother.
(She gives it to her mother.)

Mother : *(Taking the umbrella from her.)*
Thank you, Chhutki. Now don't forget to fill a bucket of water from the pump next door. Complete your homework and don't doze off as you usually do.

Chhutki : Yes, mother. Bye!
(The mother leaves. Chhutki goes back to her homework. She then notices her favourite little toy which she has named Baadshah. Picking it up she begins to talk to it).
Hello, Baadshah. I really wish I didn't have

so much homework to do! Today in class we studied all about water. Of course, it was very interesting. But I do have so many questions to ask. You are smiling as though you know all the answers already.

(She stretches and yawns, as she gets very sleepy.)

Ooh...I wish...I could...ask you...

(She falls asleep.)

(She begins to dream. In her dream, Baadshah, the toy comes alive. As he stands before her, he is much taller than herself and looks so good in his long white beard and colourful robe and, of course, with his very knowing smile.)

Baadshah : Chhutki, hello! How are you?

Chhutki : Very well, thank you! Wow Baadshah, you do look so much nicer than your little toy figure.

Baadshah : You look nice too, but just a bit sleepy.

Chhutki : Yes, Baadshah, it's all this homework that makes me so tired...!

Baadshah : Why? Now, suppose I gave you a little help, would that make things better?

Chhutki : *(Excitedly)*
Oh, yes! Most definitely.

Baadshah : You ask your questions and I'll use my magic to answer them. You can see things for yourself, so you can understand them better.

Chhutki : How?

Baadshah : You'll see.

Chhutki : Well then, as you know, it's raining outside. Where does all this water come from and how does it fall as rain?

Baadshah : To know the answer, why don't we go and ask the clouds?

*Just shut your eyes and count till three
And soon among the clouds we'll be!*

(Chhutki shuts her eyes and counts till three.)



Hello Chhutki! I am Cloudy, the king of clouds.

Up in the clouds

She opens her eyes, and is amazed to find Baadshah and herself standing in the middle of such beautiful, huge, white, and fluffy clouds as she could ever imagine. Suddenly, a big cheerful round face pops out of the clouds. It is Cloudy, the king of clouds. He wears a little golden crown.

Cloudy : Hello, Chhutki! I am Cloudy, the king of clouds. Welcome to Cloud Country.

Chhutki : *(She can hardly believe her eyes. A talking cloud! What next...?)*

Er... hello! How do you know my name?

(Cloudy smiles broadly and nods his head as if to say, "Well, I know everything." He winks at Baadshah who winks back with a smile.)

Baadshah : I think I'll take a little walk while you talk.
(He moves off.)

Chhutki : *(To Baadshah.)*
Come back soon!

(She turns to Cloudy.)

I'm so happy to meet you, Mr Cloudy. There is so much I have to ask you...

Cloudy : Go on. What is it that you wish to know?

Chhutki : Well, how is it that during the rainy season, the clouds look so thick and dark from where I stand down on the ground? Up here, everything is so bright and white.

Cloudy : Good question! Let me explain. As you know, down on the ground when the sun shines brightly it becomes hot. Water from the rivers and lakes, or wherever it has collected, evaporates. That is, it turns into water vapour which is like a gas.

Chhutki : Ah, and so it rises up. Doesn't it?

Cloudy : You are clever, Chhutki! Because vapour is very light in weight, even lighter than feather, it rises upwards, goes higher and higher till it reaches the sky. As it is much cooler up here, these vapours turn into tiny

Evaporates: turns into vapour

droplets of water or condense as clouds. When a huge number of droplets collect, clouds get thicker and heavier, much like a thick quilt. When the sun shines over the clouds, its rays cannot pass through their thickness easily. Therefore, they appear dark. But up here, on the upper side of the clouds, everything looks bright and white because the sun's rays are reflected towards you from the surface of the clouds.

Chhutki : Oh, I see! So that is it. Now tell me Cloudy, when is the time for rain to fall on the ground?

Cloudy : As you may have noticed, it is much cooler up here than on the ground. Because of this, the vapour condenses faster, till it becomes too heavy or reaches the point of precipitation. At this point the condensed droplets of water in the clouds, which become too heavy to stay up here, fall to the ground as rain. Rain falls on the Earth because of the force of gravity that pulls things down towards it.

Condense: turn from vapour into droplets of water

Precipitation: collection of a large number of water droplets formed by condensation

(There is a sudden, bright flash of lightning followed by a very loud crash of thunder. Taken by surprise, Chhutki jumps into the arms of King Cloudy for safety and clings to him tightly. Just then, Baadshah comes running.)

Baadshah : Chhutki! Are you all right?

Cloudy : *(chuckling)*

Oh yes, she is fine, just a little shaken up.
(He gently puts her down.)

Chhutki : Goodness! That was unbelievable. The light...the sound...ooh!

Baadshah : Yes, lightning and thunder, the music of the clouds...right Cloudy?

Chhutki : But, how does it happen?

Cloudy : Good question again! You see, electricity which you use for lighting your homes and cities, and to listen to the radio, is produced when negatively charged particles move in

Particles very tiny parts of a substance or material

your electric wires. These particles are so tiny that you cannot see them with your eyes but you know that they are there by the way things happen. Like on the Earth, up here in the air, we have millions of such particles and also positively charged particles. They come together in large numbers when thick clouds cluster together. These positive and negative particles always have a strange way of attracting or finding one another. When they do two things happen. One, a bright flash of light is formed and two, a loud sound we call thunder is heard.

Chhutki : It sounds just like what happens when my two neighbours quarrel with one another. I think I'll call them "thunder" and "lightning".

(All three have a hearty laugh).

Thank you, Cloudy! That was very interesting.

Cloudy : I am glad I could help.

Baadshah : Just as the lightning and thunder say it may be time to rain, I must say it is time for us to leave and continue our journey.

Cloudy : Why don't you go down with the rain, then you can see everything all the way to the ground.

Chhutki : Great idea! Could we, Baadshah?

Baadshah : Certainly! But first, we must put on our rain suits to protect us from getting wet, for there is going to be a lot of water down there.

(He gives her a rain suit to put on and puts one on himself. They bid Cloudy goodbye and leave.)

On the ground

They move through the clouds, downward at great speed along with the rain drops. Using his magic, Baadshah makes them both land very gently, though with a splash, in a large puddle of water on the ground.

Chhutki : *(Quickly getting out of the puddle and helping Baadshah as well.)*

My goodness! That was some trip!

Baadshah : Yes, indeed! My beard is quite out of shape.
(He brushes his beard into place.)

Tell me, Chhutki, do you know why we came down so fast?

Chhutki : Yes, I do. Cloudy told me. It is because of the gravity of the Earth which pulls things towards it.

Baadshah : Correct. It is what prevents things from flying off the ground.

Chhutki : That means, if the Earth did not have gravity we all would be floating in the air.



Stephen

My goodness! That was some trip!

Baadshah : Yes, and without my magic, we would have landed down here much harder.

(They both have a good laugh.)

Chhutki : *(Looking at the puddle of water.)*

You know, it's amazing to think that as it rains, this little puddle gets bigger and bigger, and soon joins nearby puddles to form a pool of water.

Baadshah : These pools of water flow into drains or small canals in the cities, and into streams and lakes in the countryside. As more water collects, it flows from these drains and lakes into rivers. The rivers travel great distances before they finally flow into big oceans.

Chhutki : That must be a lot of water!

Baadshah : Well, two-thirds of the Earth's surface is covered with water!

(The rain stops and the sun comes out.)

Chhutki : Baadshah, is that puddle of water going to evaporate now?

Baadshah : Yes, as it becomes hotter with the sun shining, most of it will evaporate.

Chhutki : My teacher told us all about the water cycle today. Now I understand what it is all about.

Baadshah : Yes, putting it briefly, when it gets hot, water turns into vapour by the process of evaporation and this vapour rises upwards to form clouds by the process of condensation. As these clouds get heavier they reach the point of precipitation, and fall as rain...

Chhutki : ...so then, what if it is not hot enough and very little evaporation takes place or very little rain falls?

Baadshah : Fortunately, there are other sources of water too. Underground water and water from melting glaciers in the mountains.

Chhutki : Underground water and glaciers? That sounds interesting! Can we go there, Baadshah?

Baadshah : Of course. Where shall we go first?

Chhutki : Let's see. We have just been up, so let's go down this time!

Baadshah : Right! But before that...

Shut your eyes, count ten in all.

And soon we'll both be very small.

(Chhutki shuts her eyes and counts till ten. When she opens them she is amazed to find that both she and Baadshah have become very, very tiny.)

Chhutki : Gosh, Baadshah what has happened to us? Where are we? Where have these huge rocks and this sea of water that is all around us come from?

Baadshah : *(chuckles)* Heh-heh-heh, Chhutki. We have become very small indeed. These rocks are actually grains of sand and the sea you talk about is actually that little puddle of water.

Chhutki : Unbelievable! But...what's happening! Why are we moving so fast?

Baadshah : Hold my hand tightly and don't worry. We are being sucked down into the ground through one of the many holes in it, along with the water.



Baadshah, look! The colour of the earth in these tunnels
and passages keeps changing as we go deeper.

Journey through the ground

They both get drawn into a hole along with a swift stream of water and gently flow downwards, sometimes fast, sometimes slow, through holes and cracks and passages of all kinds, deeper and deeper into the ground.

Chhutki : *(Pointing at the walls of the tunnel through which they are floating.)*

Baadshah, look! The colour of the earth in these tunnels and passages keeps changing as we go deeper.

Baadshah : Yes, Chhutki. The Earth is made up of many layers of rocks, soil and other materials in all sizes from large rocks to fine dust. These act as a wonderful filter made by Nature.

Chhutki : Filter?

Baadshah : Yes. Rain water from the surface of the earth passes through the soil, just as we are doing now. As it passes through, all the dirt and impure particles are trapped by the layers of the soil, allowing only pure, clean water to pass down the underground layers to where it collects. And, we are about to reach that place any moment now. Hang on!

Underground

*In a moment they land in a huge pool of cool, clean water collected in a **cavern**. They get out of the water, take off their rain suits and shake them dry. Chhutki looks around in wonder. She licks her lips, tasting the water.*

Chhutki : This is truly a beautiful place and the water is so clear, clean and tasty!

Baadshah : Tasty, yes. That is because along the way it also picks up some particles called **minerals** and salts which are good for health and give water a good taste. Now, can you tell me how people on the surface of the Earth get to use this water?

Chhutki : I know. Through wells and handpumps! We have one next to our house. We use it to pump out water for drinking, cooking and washing, and even for the plants.

Baadshah : Yes, also, depending upon how high or low it lies, this ground water makes its way

Cavern: a very large cave-like opening

Minerals: substances which are found naturally in the earth like calcium, iron and magnesium



Now hold my hand and don't worry at all.

through the soil, rocks and passages into streams, lakes and oceans. And, speaking of handpumps, would you like to see one? Meet one, perhaps?

Chhutki : Oh, I certainly would! Meet one, did you say?

Baadshah : Come with me.

(They walk a short distance till they come upon a huge column rising from under the water till the roof of the underground cave. This is actually the underground pipe of a handpump.)

We must stand near it. Now hold my hand and don't worry at all. Just keep your eyes shut till we reach the top, and don't be afraid.

Chhutki : As you say, Baadshah.

(She holds his hand. Together they enter the water and stand near the mouth of the pipe.)

Baadshah : Now we have to wait a few moments till someone up on the ground begins to pump the water out.

(They wait a few moments. Soon there is a loud booming and chugging sound, which comes from the pipe. She grips Baadshah's hand and tightly shuts her eyes. Then there is a loud swishing sound and they are sucked up into the pipe, along with a huge amount of water. Upward they keep going, when suddenly the pumping sound stops. They float up to the opening till they are thrown out of the pump through its mouth at the top.)



A talking handpump! I truly must be dreaming!

At the handpump

They land up in a big splash of water just in time to see a woman carrying away a bucket of water she had filled from the hand pump.

Baadshah : Ooohh... that was close.

Chhutki : Yes, Baadshah. We almost got carried away in that bucket of water!

Baadshah : Yes, but think of the terrible fright that poor woman would have got had we turned back to our original size in the bucket itself.
(They laugh heartily. They also hear laughter behind them. This is Happy, the handpump.)

Happy : Ha-ha! That was funny indeed! Hello there, Chhutki, and Baadshah! How was your trip all the way up?

Chhutki : A talking handpump! I truly must be dreaming!

Happy : May be!

Chhutki : Baadshah, please return us to our original size before we get into trouble.

Baadshah : Right you are!

Shut both your eyes, just as before.

And soon we'll both be small no more!

(When Chhutki opens her eyes, they are back to their normal size.)

Chhutki : That's much better, thanks. And yes, hello, Happy, pleased to meet you! The journey was short, but of great fun.

Baadshah : Nice to see you again I must say, Happy, though your joints do need oiling. It was very noisy down there.

(They enjoy a good laugh.)

Happy : Well, yes, I could do with a good oiling, but who would do it for me?

Chhutki : Why, I'll be glad to do it tomorrow. And, by the way, why is there so much water standing around here? It is quite dirty and smells awful...!

Happy : I'm sorry, Chhutki. But as you can see most of the bricks and plaster at my base are quite old and broken. The drain is also damaged. That is why water collects like this all around me. I hate it but I cannot do anything about it. Also, this water is always full of rubbish and smells terrible. Mosquitoes and other germs breed here. These can cause serious illness and diseases to people. When this infected water seeps into the ground it is sucked through me even before it can be naturally filtered, because it is so close to me. This means that the water that is pumped out could also be contaminated with germs, and people could be infected with diseases like cholera, typhoid and jaundice. I just wish someone would clean up the place fast.

Chhutki : Don't worry, Happy. I shall speak to my parents and get your broken base replastered and the drain repaired so that it will carry the dirty water far away from you to a safe place.

Breed: **reproduce** and grow in number

Infected: **spoiled** with harmful germs

Contaminated: **spoiling** the purity of water by the presence of germs

Happy : Thank you, Chhutki. That would make me very happy indeed.

Baadshah : True to your name, my friend. Now we must leave as we have to continue our journey.

Chhutki : Where are we going?

Baadshah : I'll give you a clue: to where the drinking water first begins to flow.

Chhutki : I know, the mountains!

Baadshah : *(Handing her a warm shawl and woollen socks)*
Here, first put these on.

(Chhutki puts on the socks and wraps the shawl around her. Then they both bid goodbye to Happy and get ready to leave.)

Baadshah : *(To Chhutki)*
Now shut your eyes.

*Now we both will travel, non-stop,
Straight up to the mountain top.*

On the mountain top

Chhutki shuts her eyes. When she opens them again after a few moments, she finds herself and Baadshah standing on a huge mountain of ice and snow.

Chhutki : Wonderful! I have never seen so much ice and snow in my life. And, it's so clear and white everywhere you look.

Baadshah : What we are standing on is a glacier. Be careful as you walk, for it is very slippery. This is a huge mountain of ice. When the sun shines here, some of this ice melts into...

Chhutki : ...water!

Baadshah : Right! This water collects at the bottom of this glacier and begins to flow down as a stream which gets bigger as it collects more water. It travels down the face of mountains as waterfalls, like that one over there.
(Pointing to a waterfall in the distance.)

Glacier : a river which is totally frozen, like huge block of ice, and moves very slowly



Stephen

**Wonderful! I have never seen so much ice and snow in
my life.**

Chhutki : Oh, that looks beautiful!

Baadshah : It really does, and the water is very clean and pure. The water from the waterfalls flows into rivers which begin up here in the mountains, then travels many miles down to the plains. When it rains, rainwater also mixes with this water from the mountains making the rivers full and wide...

Chhutki : ...and then, when the sun shines and it gets hot, water from the rivers evaporates into the air and condenses as clouds which precipitate and fall as rain and snow. Then on the mountains, where the temperature is much lower, the rain and snow harden to form ice and glaciers... and it's the whole cycle all over again and again.

Baadshah : Yes, Chhutki, the water cycle! It is marvellous indeed. Now I think, you ought to get back home... you have work to do, don't you?

Chhutki : Oh yes, there's homework to be done, water to be filled, the handpump to be greased, the drain to be repaired. But truly Baadshah, I've

had a wonderful time and I have understood so much. Thank you for everything!

Baadshah : I too enjoyed the trip and your company. We must plan another soon. For now, goodbye...

*Shut your eyes and count till three
And very soon at home you'll be!*

Chhutki : (*She shuts her eyes*) One, two, three...

Back home

She opens her eyes to find herself back at home, seated at her table with her homework. It seems she had fallen asleep while studying. She still has the toy figure of the smiling Baadshah in her hand.

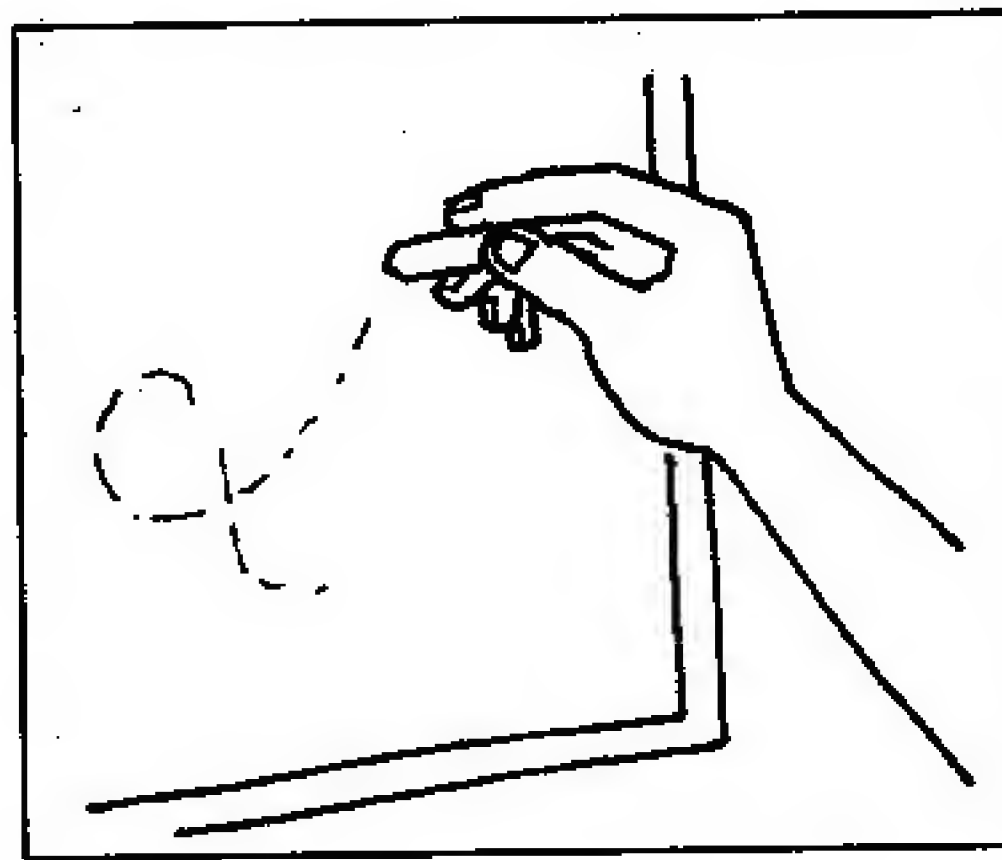
Chhutki : Was it real...or was it all a dream? It all happened so fast...Baadshah, Cloudy, and Happy...and all that water, water, water! That reminds me, I have to quickly fill a bucket of water before mother arrives. I'll also keep a pot of water ready for tea...I'm sure she would like that. And I think I'll have a wash and freshen up a bit. Water! What would we ever do, without it?



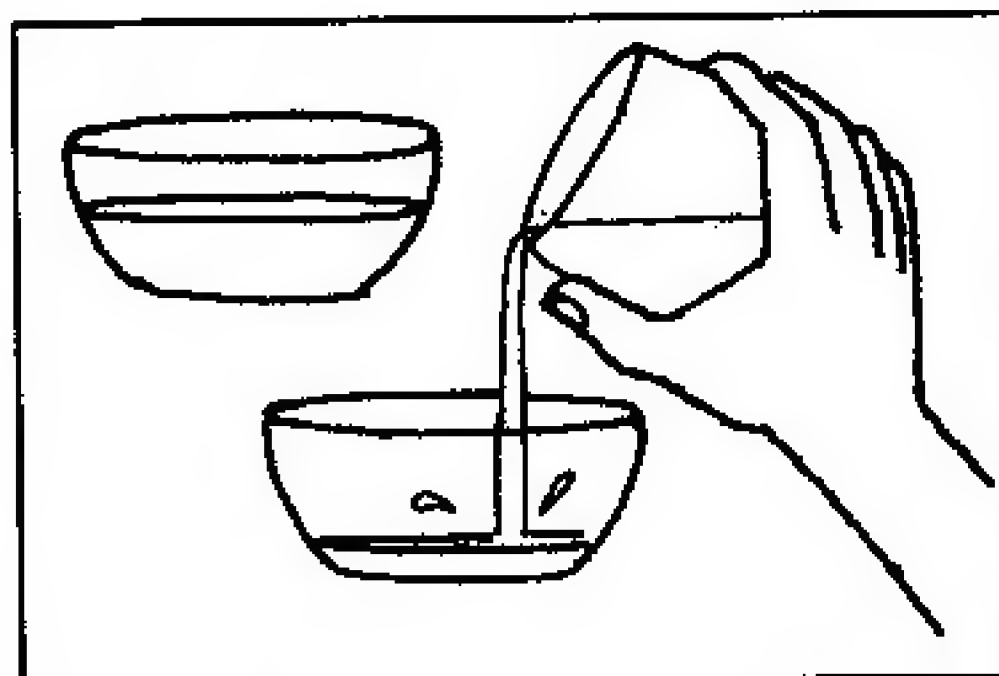
Was it real... or was it all a dream?

Evaporation

1. Soak a piece of chalk in water and draw a figure on the blackboard, even if you cannot see what has been drawn. Wait for a few minutes and you will start seeing the figure appearing on the board. How did that happen?

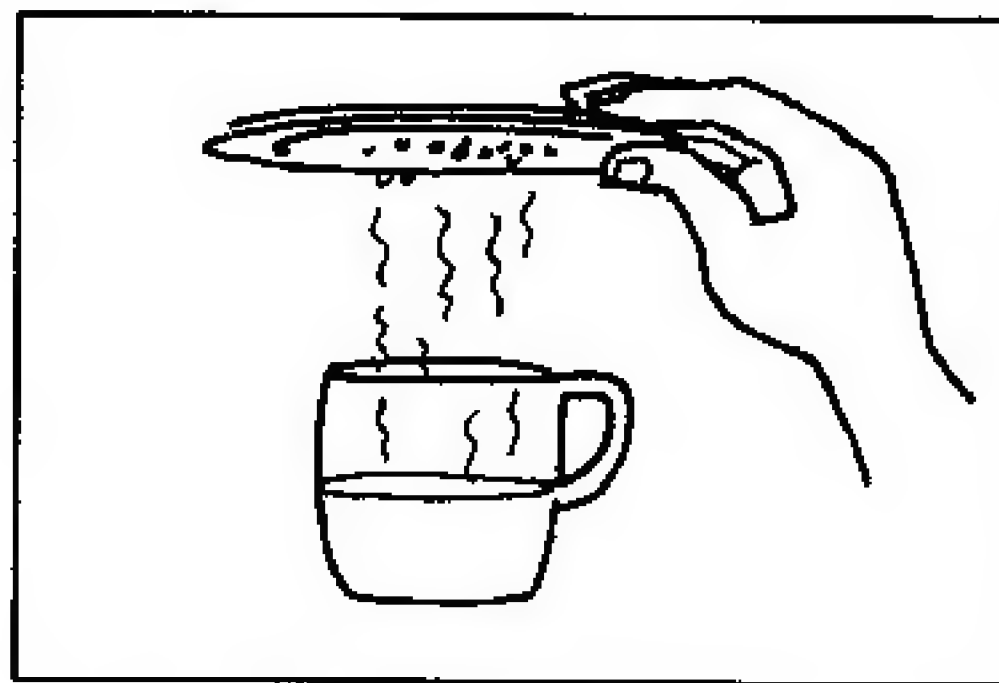


2. Take two bowls. Fill each with one cup of water. Place one in the sun and the other in the shade. Leave them from morning till evening. Then check them. Is there any change in the levels of water? Which bowl has more water and why?



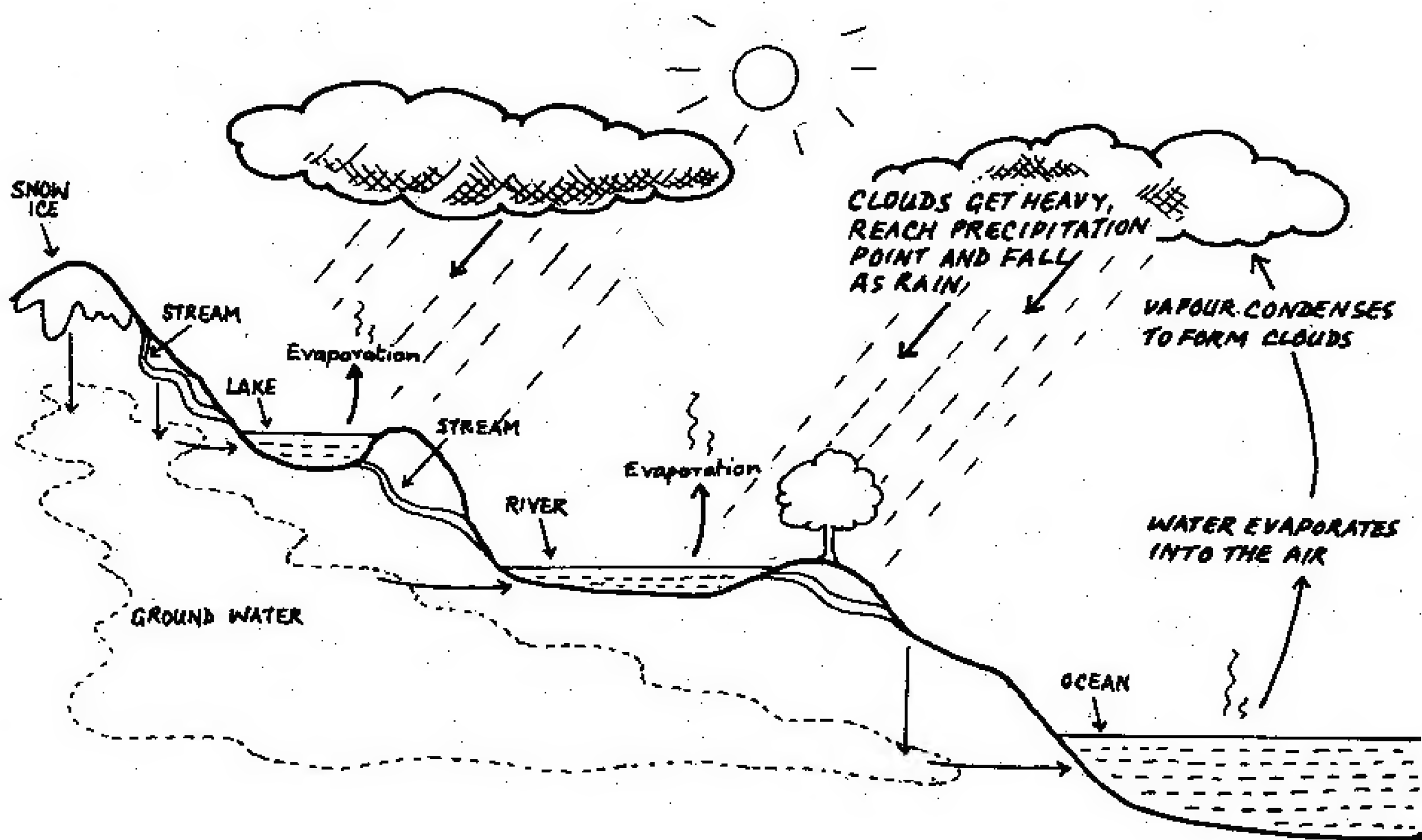
Condensation

Carefully place a mug with a little hot water on a table. Notice the steam coming out of the mug. This is water vapour which moves upward into the air and disappears. Now, hold a cold steel plate over the mug. Notice the tiny droplets of water forming under the plate. How does this happen?



The water cycle

Look carefully at the drawing given below. Copy this drawing of the water cycle on a large chart paper. Neatly colour and label your drawing using felt pens or crayons. Put your name at the lower right hand corner of the chart paper. Pin up the chart in your class and use it to explain the water cycle to your friends. Isn't it much more fun learning this way? Try making drawings of other things that you have to learn.



Did you know?

- ★ Like air, water is very important and necessary for life.
- ★ Millions of years ago, the first living things (very tiny creatures we call organisms) began their lives in water.
- ★ Most evaporation takes place from the oceans since they hold 97% of the water on the Earth and cover at least two-thirds of the surface of the Earth as well.
- ★ There has been no change in the amount of water on the Earth since it was formed. Only the form of water changes. That is, ice changes to water or water changes to vapour, or vapour changes to water or water into ice again, as the weather changes from hot to cold or cold to hot.
- ★ Our body is made up of 70% water and we must keep it like that in order to live. So, we must drink enough water every day.



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